FULL VERSION OF PENDING CLAIMS

Claim 1 (Previously Presented): A heterodyne interferometer system with carrier phase modulation comprising:

a laser light source;

a phase modulator positioned to receive a beam from the laser light source and apply a sinusoidal carrier phase modulation;

a frequency shifter for shifting the frequency of a target beam and a local beam emanating from the phase modulator, the difference between the target beam frequency and the local beam frequency designated as the heterodyne frequency f,

a reference photodetector;

a signal photodetector;

a beam splitter for deflecting a portion of the target beam and local beam to the reference photodetector and directing another portion of the target beam and local beam to a polarizing beam splitter;

a polarizing beam splitter for directing the local beam directly to the signal photodetector, and for directing the target beam to a pair of reflectors separated in distance by L, the reflected target beam being returned by the separated reflectors to the polarizing beam splitter, the reflected target beam being directed to the signal photodetector;

a signal mixer for mixing the phase-modulation frequency with the output of the signal photodetector to shift the target signal to the heterodyne frequency f and shift~~ing~~ a self-interference signal into sidebands about the modulation frequency;

a bandpass filter at the heterodyne frequency f to isolate the target signal and exclude the self-interference signal; and

a phase meter to receive signals from the reference photodetector and compare the phase with a phase of the target signal filtered by the bandpass filter.

Claim 2 (Original): The heterodyne interferometer system of claim 1 wherein the phase modulation frequency is selected to optimize the target signal having traveled the distance L.

Claim 3 (Original): The heterodyne interferometer system of claim 1 wherein the target beam and the local beam are polarized in orthogonal planes.

Claim 4 (Original): The heterodyne interferometer system of claim 1 wherein the target beam is synchronously demodulated at the phase modulation frequency.

Claim 5 (Original): The heterodyne interferometer system of claim 1 wherein the self-interference signal is suppressed by a factor of L/L_{INT}.

Claim 6 (Original): The heterodyne interferometer system of claim 1 further comprising a second frequency shifter.

Claim 7 (Currently Amended): A heterodyne interferometer comprising:

a light source for providing a carrier signal;

a phase modulator for modulating the carrier signal, wherein the phase modulator applies a modulation at a modulation frequency to the carrier signal to produce a phase modulated carrier signal;

a target path for directing a first portion of the phase modulated carrier signal to a target;

a reference path for directing a second portion of the phase modulated carrier signal to an optical reference location; and

a comparator for comparing the first portion of the phase modulated carrier signal with the second portion of the phase modulated carrier signal to determine a distance between the target and a fixed point.

Claim 8 (Currently Amended): The heterodyne interferometer of Claim 7 ~~wherein the modulator applies a phase modulation at a modulation frequency to the carrier signal, and~~ wherein the first portion of the phase modulated carrier signal is demodulated at the modulation frequency after being directed to the target.

Claim 9 (Currently Amended): The heterodyne interferometer of Claim 8 further comprising a frequency shifter for shifting the frequency of the phase modulated carrier signal prior to the directing of the first and second portions of the phase modulated carrier signal to the target and optical reference location, respectively.

Claim 10 (Currently Amended): The heterodyne interferometer of Claim 8 wherein the comparator comprises an intensity comparator to discriminate ~~between~~ a signal traveling from the target with a parasitic self-interference signal.

Claim 11 (Previously Presented): A method for distinguishing a target signal in a heterodyne interferometer with a parasitic interference signal comprising the steps of:

providing a signal source to deliver a carrier signal;

applying a modulation to the carrier signal, where said modulation is selected from one of phase modulation and frequency modulation;

directing a first portion of the modulated carrier signal to a path that includes a target and ends at an optical reference location;

directing a second portion of the modulated carrier signal to the optical reference location, the first portion and the second portion generating an interference intensity modulation including a parasitic self-interference;

demodulating the first portion of the modulated carrier signal at a frequency selected based upon the modulation of the carrier signal; and

evaluating the interference intensity modulation to discriminate between the parasitic self-interference and the portion of the modulated carrier signal that has traveled to the target.

Claim 12 (Original): The method of claim 11 further comprising the step of shifting the frequency of the carrier signal prior to directing the first and second portions of the modulated carrier signal.

Claim 13 (Cancelled)

Claim 14 (Previously Presented): A method for filtering a self-interference signal in a heterodyne interferometer from a true signal based on a phase difference between the self-interference signal and the true signal comprising the steps of:

providing a carrier signal;

phase modulating the carrier signal at a modulation frequency Ω;

directing a first portion of the modulated carrier signal to a target and providing for a return of the first portion of the modulated carrier signal from the target to an optical

reference location, the first portion of the modulated carrier signal having traveled to and from the target being designated as a true signal;

directing a second portion of the modulated carrier signal to the optical reference location, the second portion of the modulated carrier signal being designated as a self-interference signal;

providing a photodetector for receiving both the true signal and the self-interference signal, the photodetector being located adjacent to the optical reference location;

demodulating the output of the photodetector at the modulation frequency Ω to isolate the self-interference signal from the true signal; and

filtering the self-interference signal from the true signal based on the isolation of the previous step.

Claim 15 (Previously Presented): A heterodyne interferometer system with carrier phase modulation comprising:

a laser light source for emanating a beam of laser light;

a phase modulator positioned to receive the beam from the laser light source and apply a sinusoidal carrier phase modulation having a phase modulation frequency Ω to the beam, the phase modulator emanating a target beam and a local beam;

a first frequency shifter for shifting the frequency of the target beam based on a first frequency f1;

a second frequency shifter for shifting the frequency of the local beam based on a second frequency f2, wherein the difference between the shifted target beam frequency and the shifted local beam frequency is a heterodyne frequency f,

a reference photodetector for producing an output indicating a reference phase;

a signal photodetector for producing an output indicating a signal phase, the signal photodetector output including a target signal and a self-interference signal;

a beam splitter for deflecting a portion of the target beam and local beam to the reference photodetector and directing another portion of the target beam and local beam to a polarizing beam splitter;

a polarizing beam splitter for transmitting the local beam directly to the signal photodetector and for deflecting the target beam to a target reflector, the target reflector returning light toward the polarizing beam splitter;

a first quarter-wave plate disposed between the polarizing beam splitter and the target reflector, the first quarter-wave plate being oriented to rotate the polarization of the returning light from the target reflector by 90 degrees, wherein the returning light from the target reflector is transmitted through the polarizing beam splitter toward a reference reflector, the reference reflector returning light toward the polarizing beam splitter;

a second quarter-wave plate disposed between the polarizing beam splitter and the reference reflector, the second quarter-wave plate being oriented to rotate the polarization of the returning light from the reference reflector by 90 degrees, wherein the target reflector and the reference reflector are separated by a distance L, the reflected light from the reference reflector being deflected by the polarizing beam splitter to the signal photodetector;

a signal mixer for mixing the phase-modulation frequency Ω with the output of the signal photodetector to shift the target signal to the heterodyne frequency f and shift the self-interference signal into sidebands about the phase modulation frequency;

a bandpass filter at the heterodyne frequency f to isolate the target signal and exclude the self-interference signal, the bandpass filter producing an output including the isolated target signal; and

a phase meter to receive the output from the reference photodetector and the output from the bandpass filter and compare the reference phase with the target signal phase, the comparison of the reference phase with the target signal phase producing an output indicating the measurement of the distance L.

Claim 16 (Previously Presented): The heterodyne interferometer system with carrier phase modulation of Claim 15,

wherein the phase-modulation frequency Ω is 7.5 MHz.

Claim 17 (Previously Presented): The heterodyne interferometer system with carrier phase modulation of Claim 15,

wherein the reference phase is detected by a heterodyne frequency beat.

Claim 18 (Previously Presented): The heterodyne interferometer system with carrier phase modulation of Claim 15,

wherein the signal phase is detected by a heterodyne frequency beat.